Critical Care Therapy and Respiratory Care Section

Category:	Clinical
Section:	Clinical Monitoring
Title:	Use of the CP-100 Bicore Pulmonary Monitor
Policy #:	10
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1.0 DESCRIPTION

1.1 Definition: The CP-100 Pulmonary Monitor utilizes microcomputer technology to measure airway pressure and airway flow via a flow-transducer and esophageal pressure (P_{ES}) by the use of an esophageal balloon catheter. P_{ES} is an indirect measurement of the intrapleural pressure - an indication of work of breathing. The monitor also calculates a number of indices of ventilatory mechanics, patient-ventilator synchrony, and respiratory strength. All of these parameters, plus flow-volume and pressure-volume loops, may be trended and printed via the interfaced Kodak Diconix Printer. The monitor may be used with spontaneously breathing and mechanically ventilated patients.

2.0 INDICATIONS

2.1 Mechanically ventilated patients who are at risk of the adverse consequences of AUTO-PEEP, respiratory fatigue through improperly set ventilator parameters, or ventilator dysynchrony

2.2 Customization of ventilator management and weaning efforts

2.3 Analysis of bronchodilator effectiveness

2.4 Quantification of patient parameters to aid in extubation decision

3.0 CONTRAINDICATIONS:

3.1 The use of the SmartCath Esophageal Catheter or the SmartCath Nasogastric Tube is contraindicated in patients with esophageal disease including esophageal varices, tumors, ulcerations, or diverticulitis.

3.2 Nasal intubation is contraindicated for patients with sinusitis, epistaxis, or recent nasopharyngeal surgery. In these cases, use the oral route for placement of either of the SmartCath esophageal catheters.

4.0 PRECAUTIONS

4.1 To avoid erroneous measurement from moisture and/or respiratory secretions, position the VarFlex flow transducer in an upright position (with the blue arrow positioned closest to the patient). Remove the transducer when administering aerosolized solutions. The transducer may be rinsed with sterile water in the event that clogging with secretions should occur.

4.2 Do not suction through the VarFlex flow transducer. The transducer should be positioned distal to a closed tracheal suction system.

4.3 When disconnecting or replacing the VarFlex flow transducer, press the PATIENT ON/OFF key (i.e. inactive monitoring) so that proper flow-transducer calibration may be maintained.

4.4 For optimal positioning of the catheter and ensurance of a properly functioning catheter, the leak fill test must be performed prior to intubation with the esophageal balloon catheter.

4.5 Intubation with the SmartCath esophageal catheter or the SmartCath nasogastric tube must proceed with care to avoid trauma to the catheter balloon and the esophageal mucosa and/or epistaxis. If resistance is felt during a nasal intubation, withdraw the catheter and try the other nare. Although nasal intubation is preferred, the catheter may also be placed orally.

4.6 The proper procedure for catheter position verification must be followed to avoid intubation of the trachea. Tracheal intubation with the SmartCath is at an increased risk in patients already having endotracheal tubes in place. To ensure proper placement, follow 7.3.9 Procedure.

4.7 The position of the SmartCath should be checked daily to ensure optimal monitoring. See 8.1 Procedure.

4.8 To ensure optimal functioning of the monitoring system, the manufacturer recommends replacing the VarFlex flow transducer after 96 hours and both types of the SmartCath catheters after 29 days of use. These devices are intended for single patient use only.

4.9 Prior to removing the SmartCath, press the PATIENT ON/OFF key. This will automatically deflate the balloon.

4.10 The CP-100 cannot be autoclaved or immersed. Physical cleaning of the exterior may be accomplished by wiping the unit down with alcohol or Dispatch.

4.11 **NOTE:** All trend data is erased when power to the CP-100 is turned off.

4.12 Servicing of the CP-100 should only be performed by an authorized service technician.

4.13 Replace the CP-100's fuse only with one of the same type and rating.

5.0 ADVERSE REACTIONS AND INTERVENTIONS:

5.1 If epistaxis occurs during intubation, remove the catheter and apply direct pressure to the affected nare. After the cessation of bleeding, attempt again using the other nare. Alternatively, intubation may be accomplished orally.

5.2 If vomiting occurs during intubation, remove the tube and allow the patient to stabilize. Attempt again as tolerated.

6.0 EQUIPMENT

6.1 CP-100 Pulmonary Monitor

6.2 VarFlex flow transducer

6.3 VarFlex flow extension tube

6.4 SmartCath esophageal catheter or SmartCath nasogastric tube

6.5 SmartCath extension tube

6.6 SmartCath insertion supplies (see 3.3 below)

6.7 Universal precautions attire

7.0 PROCEDURE

7.1 Plug in the CP-100 and turn the power on. Follow the monitor prompt to press CONTINUE.

7.2 For use o the VarFlex flow transducer:

7.2.1 Connect the flow transducer to the appropriate connector on the front of the monitor utilizing the proper connection to the locking sleeve. Press CONTINUE.

7.2.2 Observe that the monitor performs a self-calibration.

7.2.3 Insert the flow transducer into the ventilator circuit between the circuit wye and the endotracheal tube adapter or tracheostomy tube with the tubes upright and the blue arrow closest to the patient. If using a mask or mouthpiece interface, attach the transducer securely to the interface and ensure a tight fit of the interface to the patient. Noseclips may be required when using a mouthpiece.

7.2.4 Activate patient monitoring by pressing the PATIENT ON/OFF key. Observe that a flow-transducer calibration is performed automatically.

7.2.5 To interrupt monitoring or to discontinue use of the VarFlex flow transducer, press the PATIENT ON/OFF key prior to transducer removal from the patient interface.

7.3 Insertion of the SmartCath esophageal catheter or nasogastric tube:

7.3.1 Return to the standard display menu.

7.3.2 Press PATIENT ON/OFF until the square is empty indicating monitoring of the patient is off.

7.3.3 Access the Calibration and Utilities menu and scroll to the Balloon Fill/Test menu. Press SELECT.

7.3.4 Connect the SmartCath catheter or nasogastric tube and the extension tubing to the appropriate connector on the front of the CP-100. Secure the locking sleeve. Press CONTINUE.

7.3.5 Observe that the monitor automatically performs and leak/fill test evidenced by maximal inflation of the balloon, then deflation, and finally partial reinflation. If the leak/fill test is successful, the monitor will return to the Calibration and Utilities menu.

7.3.6 Return to the standard display and press PATIENT ON/OFF to begin patient monitoring (box is filled in).

7.3.7 Assemble the items necessary for SmartCath insertion: emesis basin, glass of water, drinking straw, water soluble jelly, local anesthetic, tongue blade, flashlight, and hypoallergenic tape.

7.3.8 Follow the remaining steps below from the Operating Instructions for intubation with the SmartCath.

7.3.9 Verify proper catheter position by performing a MIP/NIF maneuver (in spontaneously breathing patients):

7.3.9.1 Access the MIP/NIF Maneuver screen on the CP-100.
7.3.9.2 Place the patient in semi-Fowler's position and explain the procedure.
7.3.9.3 Disconnect the VarFlex flow transducer from the ventilatory circuit and occlude the distal end of the transducer. Press START.
7.3.9.4 Instruct the patient to take a series of deep breaths and observe negative deflections in both the P_{ES} (the MIP) and the P_{AW} (the NIF). Press STORE when the deepest inspiration is observed and before releasing the VarFlex occlusion. This will store the value in memory for comparison with subsequent maneuvers. Optimally, the difference between the P_{ES} and the P_{AW} should be within 10 percent.
7.3.9.5 Reposition the catheter as needed to obtain optimal positioning as determined by the difference between the MIP and the NIF.

7.3.10 For paralyzed patients, obtain a chest radiograph to verify proper position of the esophageal balloon.

7.3.11 Extubation:
7.3.11.1 Deflate the SmartCath esophageal balloon by pressing the PATIENT ON/OFF key.
7.3.11.2 Instruct the patient to inspire deeply and to exhale slowly. Withdraw the catheter during exhalation.

8.0 POST PROCEDURE

8.1 Check the position of the SmartCath esophageal catheter or nasogastric tube daily by conducting additional MIP/NIF maneuvers or by verifying placement on the chest radiograph. Subsequent MIP/NIF maneuvers should be conducted with the patient in the same position as during the original maneuver.

8.2 Replace the VarFlex after 96 hours of use.

8.3 Replace the SmartCath after 29 days of use.

8.4 To prevent occlusion, irrigate the SmartCath nasogastric tube with 30 ml of 0.9% sodium chloride every one to two hours and after delivery of liquid nutrient or other medication through the tube.

8.5 Wipe down the CP-100 with alcohol or Dispatch prior to storage and between patient uses.

9.0 DOCUMENTATION

9.1 Document parameters of work of breathing, ventilatory mechanics, and weaning parameters as indicated by the patient care plan. Modify the care plan as appropriate. Refer to the CP-100's HELP screens for normal values.

9.2 Record the date of initiation of the VarFlex flow transducer and the SmartCath on the Continuous Ventilation Record. Document changes of this monitoring equipment as appropriate (see 4.0 above).

10.0 REFERENCES

10.1 CP-100 Pulmonary Monitor Operating Instructions (701-0-116D).

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